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A KOMUNIKAČNÍCH TECHNOLOGIÍ

DEPARTMENT OF FOREIGN LANGUAGES
ÚSTAV JAZYKŮ

THE IMPACT OF MOBILE PHONE TECHNOLOGY ON AFRICA
DOPADY MOBILNÍCH TECHNOLOGIÍ NA AFRIKU

BACHELOR'S THESIS
BAKALÁŘSKÁ PRÁCE

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Bakalářská práce

bakalářský studijní obor **Angličtina v elektrotechnice a informatice**
Ústav jazyků

Student: Martin Kendík ***ID:*** 195236
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NÁZEV TÉMATU:

Dopady mobilních technologií na Afriku

POKYNY PRO VYPRACOVÁNÍ:

Mobilní telefony mají pro Afriku prioritní význam a to až takový, že deník Financial Times napsal, že mobilní telefony jsou pro subsaharskou Afriku tím, čím byl parní vlak pro Evropu v 19. století. Proveďte rešerši dostupné literatury o používaných mobilních technologiích v Afice a jejich sociálních a finančních dopadech. Zanalyzujte data a proveďte syntézu výsledků, které přehledně uspořádejte do ucelené práce.

Termín zadání: 7.2.2019 ***Termín odevzdání:*** 28.5.2019

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předseda oborové rady

Abstract

The bachelor thesis deals with the topic of the impact of mobile phone technology on Africa. The aim of the thesis is to determine the most influential mobile technologies and their impact on Africa. The first part of the thesis focuses on mobile phone technologies. In chapter delating with cell phones will also be described as applications for smartphones that contribute to the impact on Africa. In the second part, the social impact will be determined in two parts consisting of the impact on education and health, where will be described different aspects of each impact. In the third part, there will be described impact on economy and banking.

Keywords

Impact, cell phone, mobile phone technology, influence, smartphone, application, health, education, Africa, banking, finance

Abstrakt

Tato bakalářská práce se zabývá vlivem mobilních technologií na Afriku. Cílem této práce je stanovit nejvlivnější technologie a jejich dopad na Afriku. První část této semestrální práce je zaměřena na samotné mobilní technologie. V kapitole, která se zaměřuje na mobilní telefony budou také popsány aplikace pro smartphony, které se podílejí na dopadu na Afriku. V druhé části bude určen dopad na společnost ve dvou částech sestávající z dvou částí, a to dopad na vzdělávání a zdraví, kde budou určeny různé aspekty každého dopadu. Ve třetí části bude popsán dopad na ekonomii a bankovnictví.

Klíčová slova

Dopad, mobilní technologie, vlic, vzdělání, zdraví, Afrika, mobilní telefony, smartphone, aplikace, bankovnictví, finance

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PROHLÁŠENÍ

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V Brně dne ....

Martin Kendík

PODĚKOVÁNÍ

Děkuji vedoucímu bakalářské práce Mgr. Pavlu Sedláčkovi za účinnou metodickou, pedagogickou a odbornou pomoc a další cenné rady při zpracování mé bakalářské práce.

V Brně dne ....

Martin Kendík

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List of abbreviations

ADSL	…	Asymmetric Digital Subscriber Line
ATU	…	African Telecommunications Union
CO_2	…	Carbon Dioxide
EASSy	…	Eastern Africa Submarine Cable System
GDP	…	Gross Domestic Product
GSMA	…	Global System for Mobile Communications
ICT	…	Information and Communications Technology
IRDC	…	The International Development Center
KES	…	Kenyan shilling
LED	…	Light-emitting diode
MFI	…	Micro Finance Institution
MFS	…	Mobile Financial Services
MMS	…	Multimedia Messaging Service
SIM	…	Subscriber Identity Module
SMS	…	Short Message Service
TEAMS	…	The East African Marine System
UN	…	United Nations
US	…	United States
USD	…	United States Dollar

1 Introduction

Mobile technology is playing a significant role in everyday life. People interact with technologies in the form of various devices from mobile phone to a fridge. In Africa, there have been a tremendous boom in mobile technology, especially mobile phones and the rising trend of these technologies is not slowing down. Africa is catching the rest of the world very fast, and in some ways, Africa is currently a pioneer.

The number of mobile subscriptions has risen from 129 million to almost 1 billion in about ten years. 1,2 billion people are living in Africa. However, only half of these people have phones. (Economist, 2016) The number of subscriptions is affected by the fact that the majority of Africans use multiple tariffs that they switch depending on who are they calling. According to the GSMA, Global System for Mobile Communications, there are now only 420 million unique subscribers in Sub-Saharan Africa. (GSMA, 2018)

The mobile industry is also majorly, contributing to the economy. The mobile sector generated 7.1% of Africa´s GDP in 2017, and it is supposed to rise by 0.8% by the year 2022, which accounts for 40 billion USD. The industry is also supposed to generate over half a million more job opportunities in the same period. (GSMA, 2018)

Research on the impact of mobile phone technology on Africa will be carried out in this bachelor thesis. First, the most relevant technologies used in Africa will be described in order to be able to talk about the impact of these technologies in the next part. There is a vast amount of technologies available. Therefore, only a number of them was chosen. Fibre optics, telecommunications, internet, cell phone and its applications are tied together, and therefore, it seems necessary to describe them. In the next part, the social impact of Africa will be described. As the social impact, healthcare, education and politics have been chosen as their impact on them has a throughout effect on the whole Sub-Saharan Africa. For the last part, the impact on the economy and banking will be reported, to fully understand the rise of the GDP dependency on mobile technologies.

2 Technologies

Financial Times (2016) stated, "the mobile phone is to sub-Saharan Africa what the steam train was to 19th century Europe: the mechanical workhorse driving social and economic transformation". From this statement, it can be assumed that Africa is technologically behind. However, Africa is levelling out the technology gap. In this chapter, technologies that play a significant role in the technological advancement of Africa will be described.

2.1 Fibre Optics

Fibre optics are the backbone of the internet all around the world, and nowadays, even in Africa. In the year 2009, submarine fibre optic was nearly non-existent in the majority of Africa. Since then, Africa took a giant leap forward. Companies all around the world started pouring significant investments into the development of fibre optics across Africa, but the government does not remain behind.

The ICT Ministers declared access to broadband as a fundamental human right. (Gerald Newengo, 2015) Major investor companies include Seacom, EASSy, TEAMs and Liquid Telecoms, which revealed in 2016 that they are installing about 100km of fibre optic cable across Africa per week. The World Bank provided more than 450 million USD to support regional networks in eastern and southern Africa. The grant is aimed to increase traffic and reduce overall bandwidth costs. (Gerald Newengo, 2015) The overall combined result of companies and government is enormous as the total length of fibre optics cable nearly doubled from 465,659km in 2009 to 958,901km in June 2014 and the continent´s speed was increased nearly 20-times which led to rose of users in North Africa from 11.8 to 35 people per hundred in the period from 2006 to 2012. (Gerald Newengo, 2015)

The further growth of internet traffic is also supported by the fact that traditional voice services are falling as said by Telone in Zimbabwe, which now focuses on growing broadband services. (Jabulani Dhliwayo, n.d.) This whole progress in the field of fibre

optics is opening doors to more and more investors specialising in the field of internet. High-speed broadband services are the norm in most developed countries. African people are starting to understand the benefits of these services and furthermost; they are beginning to educate themselves via them about them.

2.2 Telecommunications

The noticeable development of telecommunications started in the end of 1980s, when most of the African countries began to reform their telecommunications´ sector from the old form, where the telecommunication services were provided in most African countries by the government, which means that it was a monopoly and the company with the lowest prices providing the services. (Dhliwayo, 2017)

This problem became to change when the telecommunication services were acknowledged as a significant part of the economic and government departments throughout the Sub-Saharan Africa, which led to a recognition that telecommunication is majorly responsible for the productivity of the entire country. In 1999, ATU, the African Telecommunications Union has been formed to promote the rapid development of the telecommunications sector. (ATU, n.d.) The reform of the telecommunications´ sector consisted in opening up the market for the competition and allowance of multiple telecom companies to take advantage of the technological innovations to provide services that meet the different needs of subscribers. The reform led to investments in telecommunications from foreign countries. These investments had a strong potential to improve overall productivity, which had a direct impact on the whole economic growth of Africa. (Deloitte, 2014)

Africa mobile telecoms have witnessed massive growth over the last decade since the subscriptions compound annual growth rate reached 42% during 2006-2008 and still maintained 21% growth rate in the next two years, which might be seen as a considerable decrease, but in the eyes of experts, this means that Africa´s market is maturing and rapidly catching up with the western market. The mobile penetration may vary depending on the country, but the average mobile subscription penetration has reached 72% across

Africa in the third quarter of 2012. The ubiquitous trend across Africa is Multi-SIM ownership, which means that one SIM card is owned, or used, by more than one people. (Deloitte, 2014)

The percentage across countries varies, but for instance, in Nigeria, the Multi-SIM ownership remains at 2.4, which means that on 2 SIM cards are used by almost five people. This number shows that there is more space on the market and service providers have still space to grow which can be done by lowering subscription prices and overall price lowering and better network coverage as well as mobile data connectivity. (Deloitte, 2014)

2.3 Internet

The revolution of the internet began on the verge of the Millennium, but, Africa has not been catching the rest of the world in terms of the internet until now. According to world statistics, until the year 2001, Africa had only 4.5 million users. (Internet Society, n.d.) Compared with 474 million users of the internet in Africa, a growth of more than 10,000% can be observed. In some countries, take the Democratic Republic of Congo for example, on the last day of the year 2000, only 500 people had internet. At present, 5 million people have access to it, which equals to a growth of more than 1 million %. These numbers are awe-inspiring, but in contrast with penetration through the population, Africa lacks behind the rest of the world. Africa is 23.4% behind the 60.2% penetration of the rest of the world. Africa, having 1.3 billion people, which represent 17% of the whole population – 7.75 billion people, count for only 10.9 % of internet users. (Internet World Stats, 2019; Abdi Latif Dahir, 2018))

The problem of penetration is in connectivity. Internet is being brought to Africa via fibre optic cables nowadays, prior, it was satellite connection. International companies are bringing the internet to Africa using under-sea fibre optics, but the most prominent problems lie in domestic lines. The problem lies in investments made by private investors that are not keen to provide enough money, and the local connection relies only on government and laws, which are in many cases old and do not support enough the revolution of the internet. Aforementioned kind of situation could be observed in Nigeria,

where the ICT infrastructure policy was administered by documents from 1990 and 2000, which was before the breakthrough of the internet. (Mutume Gumisai, 2006)

The second problem with the number of users is the price. The target price of the internet set by the UN Broadband Commission should take only 2% of the monthly income of a family. (Kazeem Yomi, 2018) The highest average monthly income spent in the whole world - 8% is surveyed in Africa, which can be taken as an improvement from 12.5% from the year 2015, but still very high compared with the rest of the world, where 2.7% of monthly income is spent in America and 1.5% in Asia. The report also shows that countries with more mobile networks have cheaper internet, which is a trend that can be observed not only in Africa but in other countries. (Kazeem Yomi, 2019)

The project named EASSy – The East Africa Submarine Cable System is one of the most influential projects regarding internet price reduction. This project aims to connect individual countries together. Nowadays, countries, even though they geographically are next to each other, does not have a broadband connection between them, which means that the connection must go through countries outside Africa. As an example, Benin and Burkina Faso lie next to each other, but the broadband connection between them must go through France or Canada, which is a costly process. IRDC – The International Development Research Centre in Canada estimates that Africa spends $400 million for the usage of international broadband. (African Development Bank Group, n.d.)

The measurement of the broadband connection speed is not straightforward since the measurements are done for a country. The measured values would most likely differ depending on the area or even single houses. Even technologies used are playing a significant factor in connection speed as ADSL can provide speed up to 24Mbps, but 4G speed can provide up to 1Gbps. The fastest internet of Africa is being provided in Madagascar with average Mean Download speed at 24.87 Mbps – 22nd in the world as of the end of the year 2018. (Congolestic, 2017) However, only 3 African countries have placed in the top 100 countries in terms of internet speed around the world – Madagascar, Kenya and South Africa. (Cable, 2018) Although, the most interesting thing is that the internet connection is slower in some cases, compared to the year 2017, according to

Cable´s Worldwide broadband speed league. 7 out of 38 measured countries did not reach a 1Mbps connection. (Kazeem Yomi, 2017)

2.4 Cell Phone

According to Economist (2017), mobile phones are more common than electricity in most of the continent. For example, in Kenya, more than 75% of the population does not have access to electricity. However, almost 60% of the population does own a mobile phone. In a very short period time, whole communication of the African continent has changed immensely, and as a result of a massive flood of mobile devices from the rest of the world, Africa has essentially skipped the landline stage and jumped straight to the digital age. This fact is also confirmed by a survey done by Global Attitudes, which shows that on average, 97% of people in Africa do not have a working landline. (Pew Research Center, 2015)

Cell phones in countries, such as South Africa and Nigeria, are ordinary as much as in the United States, which compared to the fact that in the year 2002 in Kenya, the mobile phone penetration was around 10%. Nowadays, more than 80% of the Kenya population have access to a mobile device. (Pew Research Center, 2015) On the other hand, the percentage of smartphones in Africa is considerably smaller compared to the United States. Median of smartphone penetration in Africa is 15%, cell-phone penetration is 65% and 17% of Kenyans on average does not own a cell-phone at all. The amount of people that own a mobile device is linked to education, as 93% of Ugandans with secondary education own a cell phone compared to 61% of the population with less education owning a smartphone. (Pew Research Center, 2015) Today, Africa has over 700 million mobile subscriptions, and this number has been predicted to grow by 6% a year in the next five years. (Africa Business Pages, n.d.)

These numbers make Africa the fastest growing mobile market. People are starting to live the "modern mobile age" which could also be observed in the being done on mobile phones. Sending text messages is a prevalent activity across the whole of Africa. Taking pictures or videos being the other ubiquitous activity. However,

following these two major activities, people are using mobile phones to make and receive payments using platforms such as M-Pesa or E-Susu, which has the impact on the economy as 10% increase in data accessibility is equal to 1.3% growth in GDP. (Alison Groves, 2018) The next common usage of mobile phones includes getting health information, news, and social networking.

2.4.1 Cell phone applications

As it has been established in the previous chapter, the African mobile market is the fastest one in the world. Growth of mobile devices is slowing but is still one of the biggest in the world. However, mobile devices by themselves are not sufficient enough, and therefore, they need some enhancement. Applications make the mobile devices usable, profitable and useful. The African market for applications is not very similar to the market in rich countries, i.e. the United States. In Africa, the applications market has other priorities. (Lebo Matshego, 2017) Applications made for Africa have to be much more efficient concerning battery life and data usage. The power outlets cannot be found everywhere as it is usual in other parts of the world, and electrical energy is very valuable. Data consumption should also be optimised since the cost of services is much higher and also the speed is lower which was also confirmed by AppsAfrica research that found that 72% of respondents have prepaid arrangements and have to be conservative with mobile data. The primary developers have already started creating data efficient versions of their apps, i.e. Facebook Lite, Twitter Lite. (Damian Radcliffe, 2018; Louise Bleach 2014)

Research provided by AppsAfrica (2016) also shows that people across Africa are willing to pay more for health applications rather than gaming applications. Application developers also need to aim and focus their applications onto a specific market. The market changes depending on the area – rural, urban. Another variable that needs to be taken into account is language as Africa has more than 2000 languages and dialects across 54 states. The last major problem worth considering is the platform. Android application has much broader usability as 51% of the market are Android phones. Also, GooglePlay Store – Android application market, does have fewer restrictions concerning the release, lesser application and development costs, and availability across the globe is broader than other systems. After the application is successful on one platform, it is considered safe to

move onto other as well. In this chapter, a description of some useful applications with a significant impact on Africa will be provided. (AppsAfrica, 2016)

2.4.1.1 E-Susu

E-Susu is a mobile app that works on a principle known to people all around the world, but preferably Africa, for a very long time. The classic Susu, not digitised, performed a role of pooling savings used in places where formal financial services are not developed enough, and many people cannot use them due to insufficient knowledge about finances or lacking financial system in particular country. Susu is a type of informal saving club where each member puts a sum of money into a so-called fund, and each time one member takes all the money in the fund which is why many people call it "merry-go-round". Susu developed from a system called Tontine, which is very similar as they were based on the same principle as Susu. However, it was a more long-term investment. Each time a member of the community died, his share was divided between the rest of the group, which led to murders, as the last living member collected all of the earnings. The system of Susu is based on personal trust and relies on the organiser and his integrity to disperse the money regularly. Susu is usually formed within a broader family or a group which is very close, commonly a tribe. For the E-Susu, the principle stays the same, and only the process has been digitised.

The primary objective of E-Susu is to bring the old principle of Susu to the 21st century and make it more accessible. After the registration and invitation of family and friends, saving of funds can start. The huge benefit of the digitised process of collecting money is safety. The entire process functions cashless since everyone is using his or her bank accounts for investing and raising money. Furthermore, E-Susu collects the credit info which can be consequently used to be provided with loans from banks like Barclays, since people have a confirmation of their savings and confirmation of capability to organise finances.

On the other hand, E-Susu has some disadvantages as well. One of them could arise when one member of a group in which a specific user is would not pay his share, which can cause a chain reaction. To prevent such difficulties, insurance would be a

possibility. However, this approach would almost definitely cost money, and that would defeat the fundamental purpose of Susu, which is accessibility. The second disadvantage is social connection. This problem is holding the whole concept of digitised Susu back. People in Africa are not ready to lend money to strangers. Usually, the group was formed by members of the already existing social association as was stated before in the text. According to the creator Abbey Wemimo, current users of E-Susu overwhelmingly rejected the idea of being paired with people they do not personally know. (Adedamola Agboola, 2018)

2.4.1.2 M-Pesa

M-Pesa, a mobile phone-based money transfer similar to Google Pay and Apple Pay, is being primarily used in Africa as a substitution to the two afford mentioned payment services and has been named after the Swahili term "pesa" meaning "money". The system was launched by Vodafone´s Safaricom mobile operator in 2007 as a simple method of microtransactions between users in the form of texting. (Momoh, 2018) M-Pesa allows users to do regular banking transactions such as deposit, withdrawal, transfer to pay for goods or to pay another user quickly with a mobile device using telecom services not needing an internet connection. M-Pesa is also connecting people worldwide as one of the main features of the application is receiving and sending money abroad, which is an impossible task for people without some electronic banking system.

Very similarly to Susu, M-Pesa performs a significant role in the development of small businesses in the form of microloans. The concept of M-Pesa is built as a direct banking service (sometimes called branchless banking service), which means that the company does not use offices or agents and their services are done remotely via online and telephone banking, which significantly reduces costs of running a branch office. Since the M-pesa system does not need any branch offices, the system uses banking agents. Banking agent owns or operates as an employee of a retail outlet that conducts transactions that are allowed and provided by M-Pesa, which are stated above in the text. These agents are using conventional equipment such as card readers, mobile phones, barcode scanners, and personal computers to stay connected with the bank to provide

sufficient services. The primary role of these agents consists of pre-buying mobile money so that they can sell it to a potential customer afterwards.

With 30 million users across ten countries, M-Pesa has a real impact on the growth in still developing countries. The system processed around 6 billion transactions in 2016, which played a significant role in reducing poverty. According to Vodafone (n.d.), 2% of Kenyan households lifted out of extreme poverty through access to mobile money services, such as M-Pesa.

2.4.1.3 mHealth

Mobile health (mHealth) has been described as a health-enabling tool that provides a positive impact on access, quality and a cost of health care, which is used by institutions, organisations and individuals. mHealth is using mobile devices such as mobile phones, smartphones, tablets and sensors. mHealth applications include education, awareness spreading, diagnostic and treatment support, remote data collection and monitoring. People using mHealth are able to make and receive phone calls, SMS or MMS related to health education and health condition. Announcements concerning health are also established via messages which are considerably more efficient than announcements done via television or radio. Also, the healthcare workers job becomes more feasible since they have access to information about patients in the system, which happens much faster than in paper form. All of these applications are now being put into mobile application start-ups all over Africa.

As an example, in Kenya, a very perspective application called MedAfrica developed in 2011 by two local entrepreneurs funded by European Venture capital. This application was from the start prevalent as by the fourth month of its existence had over 70,000 users and 1000 more download every day. MedAfrica application serves as an information tool, where people can directly obtain information and health services. The pivotal plan from the beginning was to sell ads to fund the application and then offer premium content for a subscription as well as charge doctors 10$ to access user database. However, this did not meet the expectations, and the application remained completely free. The application accesses data from various sources such as hospitals, local doctors,

and plans to obtain data from the Ministry of Health about disease outbreaks and counterfeit drugs. MedAfrica is just one of the health-based applications that currently operate in Africa, but the purpose of these applications is substantially equal to this one. (Murray, 2012)

2.4.1.4 iCow

iCow is a text messaging and voice-based mobile phone service that provides farmers with helpful information about farming. The application itself provides four products for farmers, depending on their needs. The potential of this service happens to be enormous as 80% of Kenyans farms their land. The iCow system was officially launched in 2011 in Kenya by Su Kahumbu Stephanou after it has won an East African regional competition called Apps 4 Africa. It started as a mobile phone cow calendar, but since then, it developed in a fully functional service. According to Kahumbu, M-PESA was a big inspiration for her project. (n.d.) (Raghavan, 2013)

The first product is, called Smart Tools, and its purpose is to provide solutions to problems concerning planting crops. The second product is the Farmer Library. This particular product serves as a library of agriculture in Africa in which people can browse and collect vital information. The third product is called Kalenda, and it provides farmers with essential dates and cycles regarding farming, for example, feeding schedule. The fourth product is called Mashauri. This product occurs to be the most significant of them all since it provides farmers with permanent access to production knowledge, which solves the lack of experts in the area. As an additional feature, iCow now provides a market where can farmers sell and buy equipment or cattle.

Since the launch, the service has expanded to nearby countries such as Uganda, Tanzania or Rwanda and Ethiopia. The cost of a text message was about 10 US cents in 2011, which is about 10 Kenyan shillings. However, the price has been reduced by half in the year 2013. (Raghavan, 2013) The service is paid by government and aid programs in Tanzania and Ethiopia. The cost Stephanou has launched a crowd-funding service that allows people from all around the world pay for a one-year subscription that costs 15

USD and provide support to farmers. In 2017, iCow had about 50,000 to 60,000 farmers using the service. (Shapshak, 2017)

In the year 2018, the iCow application for mobile phones was launched. The application provides all of the features from the text-messaging platform and includes a collection of audio conversations between renowned veterinary surgeon and farmers across Kenya. (iCow, 2018)

2.5 M-Kopa Solar

M-Kopa is a Kenyan company using the pay-as-you-go model to provide rent-to-own solar energy products. The company aspires to establish and provide cheap solar power sources to rural areas. The equipment M-Koppa provides includes solar panel, rechargeable radio, control unit; four low-energy LED light bulbs, universal phone charge cables and an LED torch. The pay-as-you-go model involves a starting deposit, and then the customer pays a daily payment for a period of 420 days. (M-Kopa, n.d.) After the customer pays the total price, the equipment belongs to him. However, the interest of 26% is being questioned as the interest rates are high for U.S. or European standards. On the other hand, in Africa, these rates are competitive, compared to other services offering loans. (Toby Shapshak, 2016)

As of January 2018, M-Kopa has provided 600,000 houses with their devices and connected them to electricity. (Abdi Latif Dahir, 2018) M-Kopa estimates that the project saved $450 million in the four years of operation. Besides, Solar energy provided serves as an ecological substitution to kerosene, commonly used fuel. This substitution has reduced the emission of CO2 by 780,000 tons. (M-Kopa, n.d.)

M-Kopa has also moved into other directions and started to provide loans to pay off scholarship fees and sell smartphones. According to the company, a quarter of people that have started using one of the programmes moves to another. The smartphone can be provided with no deposit, and the price can be added to already operating loan, which extends the payment period. The additional feature of the M-Kopa control unit that is

provided by the company lies in capturing and processing of data, which can be used as a statistic to help improve the services. (Stephan Faris, 2015)

3 Social impacts

3.1 Impact on health care

Health care presents itself as one of the main social impacts. In the past, there were no services that would monitor diseases in real-time, which made it hard to prevent anything since the disease could quickly transfer to another region and therefore the help would be too late. Cell phones are changing these events since they can provide real-time surveillance. This surveillance can show that the number of people dying and from what are people suffering and provide these data to the global and national organisations that can respond much faster and possibly save more people and spreading of such disease.

As an example, in Kenya in the years 2008 and 2009, researchers mapped travel habits of nearly 15 million inhabitants using their cell phones. (Talbot, 2012) The map of travel was therefore compared to the malaria incidents from which researchers developed a tool that can find settlements which were acting as a significant source of parasites and thus prevent this kind of incidents and not only clean problems already caused by the disease. Mobile technology played a significant role in the diagnostics of this disease. According to Edlund, 200 million small devices that perform as diagnostic tools are distributed in Africa each year. These devices give a simple outcome of 0 or 1, which can tell with almost 100% reliability if a person is infected or not. (Social Good Summit, 2013) The cell phone is used as a transfer medium to send the test result and therefore get proper treatment in the fastest time possible.

Tracking the headcount can be seen as another advantage. Parents can register a baby after being born through the internet, thereby reducing the number of children dying without a chance to get proper healthcare in consideration of supplies of vaccines are send for a certain amount of people, and that leads can result in another solvable problem. Remote facilities nowadays, are able to track the levels of stock in real-time and can be supplied considerably faster and also ask for supply through a computer or a cell phone. These facilities are also able to track record of patients and their health records and therefore, can provide proper treatment as well as keep awareness of diseases as patients can keep in check with them. Maybe the most significant advantage of using mobile

technologies in health education. Tina Rosenberg claimed that "the biggest fix in global health in the coming years will be "harnessing the power of peer pressure" to get people to adopt healthy behaviours." (Rosenberg, 2011)

A mobile system called mHealth works on a principle of SMS messages where these messages are sent to people and contain educational information about the health situation in the area such as diseases spreading health care availability and treatments. This system of text messaging also helped to reduce counterfeit medicine as a young 28-year-old Ghanaian doctoral student Bright Simons came with an idea to put unique codes within the medicine packaging that buyers can send via SMS to find out whether the drug is genuine or not. This project is now used in various countries, considering that the World Health Organization estimates that nearly 30% of medicines supplied to Africa are not genuine. (Ogunlesi, 2012) These precautions appear to be straightforward, yet they are very effective, and even if these systems improved the health care by 1 %, 69, 000 more children under age five would survive each year. (Berkley, 2013)

3.2 Impact on education

Africa moves very fast regarding information and communication technology, with an immense impact on education. The quality of education suggests a significant issue and technology might be part of the solution. Communication represents a crucial part of the daily life of a vast majority of people in Africa since the prices of telephone dropped, and the usage, on the other hand, has risen rapidly. A mobile phone provides many features such as SMS, voice calling, video, music, reading texts and all of them have a potential for improving access and quality of education. Since 1970, Africa used mass communication technology in the form of radio and television to promote education, which reached many people at low cost. By the year 1990, mass distribution of computers started and schools across Africa were equipped with a computer and educational software. These improvements all had some impact on education. However, the major problem was the inexperience of pedagogical staff that had problems using these devices and limited time with pupils.

In the year 2005, a project named One Laptop per Child aimed to equip schools with laptops at a low cost. Two million teachers and pupils are involved in this project as well as 3 million devices that have been delivered by now. (One Laptop, 2018) One Laptop per Child allowed pupils to learn at home without the need of a teacher. Since the year 2010, mobile communication technology had taken over with easier access to educational resources, the possibility to learn on the go, in and out of school. (d´Aiglepierre, Aubert, Loiret, 2017)

Mobile learning or M-learning is education that makes use of a mobile device such as a cell phone, smartphone or a tablet. This form of education grants multiple benefits in various forms. The first benefit lies in usability in the sense that pupils know their devices and does not have to be taught how to use them since they are using them in their everyday life. Communication with a teacher or other pupils also brings a considerable benefit as everyone in one class with a smartphone can check homework, get answers and feedback on various tasks very quickly without the need of an eye-to-eye contact which can be very hard to find time for. The access to the information is possible almost everywhere since one can download materials, books and apps and use them without connection to the internet or a telephone signal. Project Yoza Cellphone Stories demonstrates the aforementioned accessibility by offering downloads of stories and novels on-the-go, which allows people to read and enjoy mobile novels or M-novels on the way to work or a school. Yoza achieved 470,000 total reads is first 18 months. (Vosloo, 2014)

As an alternative to a mobile phone, Kindle-style readers are also prevalent in Africa. Non-profit organisation Wolrdreader has provided school children with more than 600,000 readers since the year 2010 and had over 3-9 million handsets in total. (d´Aiglepierre, Aubert, Loiret, 2017) M-Thuto, the separate illustration of M-Learning, was developed by Dr Mmaki Jantjes during her PhD studies in the Department of Computer Science at the University of Warwick that is helping pupils in Africa to deal with math and science subjects. Students aged 16-18 were provided with a mobile phone pre-loaded with an application and mobile data that allowed them to study at home. The app itself was designed to supplement the classroom teachings, notes and access to e-learning materials and books and everything on the app was available in both English and Setswana language. (Walton, 2017)

The whole e-learning method of studying, however, needs a few adjustments as well. The students themselves needed to be prepared and taught how to use these devices and how to maximise the educational profit from it. Also, the resources that are used have to be trusted. Teachers or tutors need to pick the best available resources to teach from and also, they need to know how to find these sources and verify the information provided by these sources. Moreover, finally, the device itself needs to be chosen carefully to provide the most at the given task. (Gwyneth, 2016)

3.3 Impact on politics

Sharing of information is one of the most powerful abilities people can do, and mobile devices are the medium. As has been seen in the rest of the world, the arrival of social media platforms changed the world. Social networks can be taken as the most commonly used medium to share information. Through these networks, people are allowed to share their opinion on everything from their day, to complex politic agendas. 60% of African population fall under the age of 24. (Andre Pienaar, Zach Beecher, 2019) This age group also occurs to be the most common to use social media, which is a trend that can be observed across the world, according to the Pew Research Center´s report (2018). Africa has now an excellent opportunity to shape this age group and motivate them to use social media. On the other hand, social media and the internet does not have to be necessarily positive in all cases. Social media can bring people together and also tear apart.

Africa´s history is intertwined with conflicts and politic struggles, so internet propaganda and persuasion of people must not be taken lightly. Government and other vast social groups are responsible for taking control and stepping against the oppression of small groups and minorities. Underestimation of these risks can result in radicalisation and violence outbreak amongst African people. Terrorist and other extremists groups take advantage of social media to persuade and draw the younger population. These groups are using the fact that the younger generation, the majority of the African population, happens to be the most vulnerable and most shape-able group. Extremists group take the

stance that they can give African people more in terms of a bright future and relieve them from the stress they might be living in, all doing by posting highly produced videos with facts, which are not feasible to check without the knowledge and experience with the sources. In most severe cases, the propaganda could be involved in the election process and influence the result, which could result in the change of regime. (Andre Pienaar, Zach Beecher, 2019; Nmachi Jidenma, 2014)

From the right side of the problematic, internet and social networking has an immense potential to build a long-lasting peace and growth across Africa. The work of Peace Tech Labs can be portraited as an example of building peace. Their actions take place mainly in Africa and other countries of the third world. Their work incorporates monitoring social media pages and websites with criminal, extremist and radicalising content. With this analysis, responsive authorities can be informed about this activity in advance and therefore prevent these activities. (PeaceTech Lab, n.d.)

3.4 E-Government

E-Government, a relatively new phenomenon in the world of ICT. E-Government can be defined as a use of ICT to deliver services to citizens, businesses and inter-government network. The aim of this project lies in time effectiveness and also cost-effectiveness. Estonia, commonly used example of properly functioning E-Government, is currently offering 99% of government services online and claims that saves 800 years of working time per year as a result. (NEC, 2018)

Africa, considering its position regarding ICT, is currently in great shape to implement E-Government into the system. However, reality does not seem as bright as it may. Only four African countries have been ranked as having a high e-government development by United Nations E-Government Survey (2018), with 30 more as having visible progress. The average rating of Africa is still lower than all other continents. The problem still lies in the low adoption of technologies by poor class. The E-Government system makes it only profitable for people from middle or high class that have access to technologies, especially the internet.

The additional problem appears in the form of government itself. Some countries in Africa do not have a properly functioning government, and they also struggle with corruption and armed conflicts. Government system also lacks the finances or funding to realise this project. (Karin Kaup Lapõnin, 2018)

The benefits of E-Government would be immense. First, democracy would benefit from electronic election service that would be transparent and fair, which would be monitored electronically, and the actual voter would need a registration. Second, citizen identification could also be made via electronic devices, mainly biometric sensors. At last, economic would benefit in the form of small investors and companies that could be established much faster due to an electronic application. In addition to the last point, payments done electronically would be less vulnerable to corruption and much more efficient. (Justine Olawande Daramola, 2019)

4 Impact on economy

Despite the fact that the rise in the number of mobile technologies slowed in the last few years, the growth still stays above the global average. The essential fact coming out of this number is the growth of GDP – Gross Domestic Product, predicted to rise by 0.8% to 7.9% by the year 2022, which can be converted to $150 billion of economic value according to GSMA (2018). These numbers, however, are not only made by mobile technologies itself but the effect such as productivity, caused by mobile technologies, must be counted as well. Productivity may be seen in the form of lowering information costs in the form of a simple call rather than travelling a long way. The rise of GDP is also supported by a prediction that the number of smartphones will also rise by 440 million as well as the mobile connections will rise to 87% from 37%. However, these facts are very promising, but the reality nowadays does not seem promising - Africa, being the lowest penetrated part of the world and positioned well behind the global average, and in the next seven years, the numbers are not expected to change exceedingly. (GSMA, 2018)

4.1 Mobile operators

Mobile operators contribution to the economic growth of Africa count as 1.9% of GDP. The mobile operators provide essential voice and text services as well as mobile broadband connection – the internet. In the year 2015, only 1% of Africa had an opportunity to use 4G internet. In the year 2020, the number of 4G users is expected to change to 12%, according to GSMA (2018). Also, in the same year will prevail 3G service as the dominant broadband and 50% of African people will become users of the service. New investors in the internet services market majorly support the change, as six new networks had been launched in the first half of the year 2018 alone. The growth in internet services region considerably boosts the revenues that are made by the operators, which had gone up by 4% in the year 2018. The growth in the mobile ecosystem has also helped with employment as it provided nearly 3 million jobs if the productivity that has been mentioned in the first paragraph of this chapter is taken into account.

4.2 Mobile money

M-Pesa, which has been previously introduced in this thesis, holds a position of one of the most influential mobile applications in the African economy, especially in mobile money. M-Pesa, among other 134 applications, has been able to make 1.2 maker spaces digital transactions with an overall value of $19.9 billion, which is a growth of 17.9%, respectively 14.4%. Mobile money serves a purpose enabling people to transfer money safer, faster and almost effortless, which can be portraited a crucial factor in making rural areas accessible to the digital world. Lowering the prices of smartphones, which has gone down from $227 to $101 in the course of 5 years also support the fact mentioned above. The key to prosperity in the mobile economy also lies in demography. Opportunity to train a generation of innovators and skilful people that would only benefit from mobile technology can be found in the fact that almost 60% of the African population is under the age of 24. (Toby Shapshak, 2018)

4.3 Mobile start-up programmes

Innovation performs a significant part of connecting Africa with the rest of the world and a significant way of getting money from investors flowing into African technological companies. Tech hubs represent a critical part of this ecosystem. Mobile platforms and applications for them present a channel that can address various socioeconomic challenges. In 2018, Africa had 355 tech hubs, which shows an incredible growth from 2016´s 239. The main start-up domains appear to be Fintech, solar, e-commerce and ed-tech, which in total account for 73% of the shares of investment. Mobile operators mentioned in the above chapter also support the growing market of tech hubs. Mobile operators help develop start-ups with investments as well as providing network capabilities.

Furthermore, the help can be beneficial even for the mobile operators as the start-ups can create new investment opportunities and innovations which help expand the applicability of services of such operators. The hubs with most reception are Kenyan iHub, CcHub from Nigeria that partnered with Facebook and NG Hub from Lagos. As a

sign of improved perception on tech hubs, GSMA released a report in the year 2017, claiming that 49% of technological hubs have a partnership with corporations such as Microsoft, Google and Ashoka and 13% has an association with mobile operators Orange, MTN and Vodafone. (GSMA, 2017)

4.3.1 iHub

iHub – innovation hub represents a place for the technology community, which includes co-working spaces, makerspaces, hackerspaces and others. Erik Hersman opened iHub in Nairobi in 2010, and since the start, it has helped to develop more than 170 technology start-ups. Since the launch, iHub developed follow-up departments – m:lab incubator, iHub Research and iHub Consulting to furthermore progress their activities. The ultimate aim of iHub is not only developing new technological start-ups but to develop active start-ups that are not getting enough attraction. These aims are being provided in the form of mentorship, business support, workshops, events and funding. (Toby Shapshak, 2016)

4.4 Impact on banking

The effect on banking caused by mobile technologies was major. 75% of people in Africa still did not have access to a proper, formal, bank account in 2015. However, with the rise of mobile devices and the internet, people are able to create mobile banking accounts that serve as a time and money-saving alternative. At the end of 2017, 55% of Kenyans did not have access to a financial institution. In comparison, 94% of U.S. citizens did have access to a financial institution. (Diana Brazzell, 2017) Kenya will serve as an interesting example of this topic. As was mentioned in the Technologies chapter, M-Pesa is a mobile banking app with a significant impact on Kenya, ultimately on the whole of Africa. The impact of mobile banking applications such as M-Pesa or Airtel Money can be portraited by the numbers of Global Findex - a research carried out by World Bank (2017). In the period of time from 2014 to 2018, Kenyan number of accounts have gone up only by 9.2%, a rise from 74.7% to 81.6%. Besides, in the 40% of poorest adults, the

growth was 11% - 63.4% to 70.5. If these numbers are compared with the rest of Sub-Saharan Africa, where a percentage of adults in the year 2018 with a financial account, not considering whether it is mobile or not, the percentage of 42.6%, period growth of 24.5% seems considerably low. More interesting is the increase in these categories between years 2011 and 2014, where the individual growth rates were respectively 76.6% and 206.3%. Again, if this number is compared with the rest of Sub-Saharan Africa in the same period, the growth being 47% may seem significant, but the difference of 11% is only minor compared with Kenya. (Jay Rosengard, 2016)

These differences between Kenya and the rest of Sub-Saharan Africa are attributed to mobile banking accounts. The success of M-Pesa has attracted new companies that want to use the rising interest in mobile banking. Airtel Money, the company of Equity Bank, had entered the market in 2010, and since then, it performs the role of a valuable opponent of M-Pesa and giving people an opportunity to choose. This affected the rise of the number of mobile money accounts, in the period from the year 2014 to 2018, from 58.4% to 72.9% in Kenya. If these numbers are compared with Sub-Saharan Africa again, the rise was only from 11.6% to 20.9%, and in the Lower Middle-Income countries, the rise was only from 3.2% to 5.3%. (The World Bank, 2017; Jay Rosengard, 2016)

The positive effect of the growth of mobile banking also had a negative effect on MFI – Microfinance Institutions that are credit-only, which suffered a fall of users from 7.7% to 0.4% in the year 2016. The fall has been partly a consequence of the MFS – Mobile financial services not sharing the credit score of their users. MFI´s are, on the other hand, better regulated and offer better consumer protection. Also, MFS´s are vulnerable to connection interruption and service unreliability. (Jay Rosengard, 2016)

The competition between mobile banking solution companies has attracted a whole new community to join the mobile banking trend. Competitors constantly improve the terms and quality of their services to attract more customers. Mazer and Rowan (2016) have provided an insight to M-Pesa tariffs, and from their inspection, it seems clear that M-Pesa has lowered tariffs for small transactions and raised tariffs for high transactions (Rafe Maze & Philip Rowan, 2014). This change can be observed on the curve of the growth for the 40% of poorest adults. (The World Bank, 2017) Also, the battle for

dominance on the field of mobile banking has led to new inventions in the field of mobile banking, i.e. mKey.

mKey presents itself as a "keyboard app", meaning that the payment app is directly built into the keyboard on a smartphone that lets the user send and receive money only by using the keyboard. User does not need to open the application and only click a button, which acts very intuitive and saves time and knowledge needed to make transactions. Also, customers can get loans from mKey, from little as much 200 Kes (equal to $2) up to 1 million KES ($10,000). (Kenn Abuya, 2018) Major positive of mKey is that it does not need a history of user´s contacts and loan financial history. Profile of a user gets set as a completely new user, and the user´s financial history is not taken into consideration, which means that people can borrow higher amounts at the start. This appears to be a factor that is very unlike other financial applications and brings more people in to use the application. M-Pesa and other applications that offer loans can go high up to 700,000 KES ($6900). Another major positive, interest rates are also lower compared to other applications and companies that offer loans. (Money&Markets, 2018; mKey App, n.d.)

The rest of Sub-Saharan Africa has now observed the impact of mobile financial services in Kenya and should follow the steps that Kenya has taken to achieve such success. People, as the demanding side, have to show the need for the accessibility and affordability of financial services. The supply side, financial services, should be ready to accept and provide for the need of the demand side. For the development of mobile banking, one company should lead the market with their share and also their prices. Only after the people become familiar with the services, other companies can enter the market as competitive alternatives. Even though these steps seem feasible on the paper, the reality can be completely different. Not only laws and regulations are different depending on the country and its regime, but also the historical and cultural past can be influential in the process of adoption of a new mobile financial service. M-Pesa had very similar experience in South Africa, where due to the technological and banking advantage, the service lacks the success it has in Kenya. (Jay Rosengard, 2016)

One of the possibilities of further advancement of mobile payments and owing a financial account could be the development of mobile payment solutions such as Google

Pay and Apple Pay. Both of these services can hold multiple payment cards, provide a safer solution and user does not need any contact with a financial institution to install the card into the mobile. Both Apple and Android are leaders in mobile operating systems, and neither of their payment applications is available in any of African countries. Samsung Pay has been the first to break the barrier, and their service can is nowadays available in South Africa.

5 Conclusion

This bachelor thesis focused on the impact of mobile phone technology on Africa. Research on various websites and books, which are stated in the references, was done. First, mobile technologies with a vast amount of impact were described. I chose mobile technologies with an emphasis on their importance and their overall impact on Africa.

In the first chapter about fibre optics, I found out that the majority of under-sea cables was deployed only in the past decade and development is not even close to finishing. As of telecommunications, the development is nearly the same compared to the rest of the world. However, the penetration of services is lagging. I found out that Africa´s cell phone market is the fastest growing in the whole world and has room to expand even more. In the chapter about cell phones, I decided to describe some of the most popular applications for smartphones that also had a significant impact on either social or economic aspect.

In the second part of my bachelor thesis, I evaluated the impact of mobile technology on society. For this purpose, I chose health and education and politics. In the first part about health, I found that the mobile connection is helping people to educate themselves in addition to getting all the help they need much faster. The sharing of helpful information about help is also a huge benefit as people with mobile technologies can educate everybody else. In the education chapter, I observed a significant benefit for pupils in the form of the possibility of learning on the go. The ability to communicate with teachers and other scholars not only on the school grounds.

In the final part of my bachelor thesis, I concluded a research on the impact of mobile technologies on the economy and banking. As the most major impact, I chose the GDP growth and researched the aspects that influenced the rise, such as mobile operators, internet and start-up projects. The mobile banking domain and applications have also influenced the economy as well as banking, which is the last part of my thesis. Banking has been majorly influenced by mobile technologies that give them an opportunity to create a banking account without a need to visit a financial institute. Mobile banking can also have, in some cases, better conditions. Credit history is also not needed, which helps the majority of people with less or no financial history.

To conclude my essay, the range of the topic is extensive. I tried to conclude the most influential mobile technologies and their impacts on the society and economy of Africa. Sharing of information and the impact of the internet have had the most influential impact throughout the mobile technologies and all of the impacts. Future research on this topic can be done to provide more technologies and more impacts on the society and the economy.

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